

What is claimed is:

1. A method to produce a rechargeable battery in which the electroactive species is an alkali metal comprising the step of performing one or more preliminary reactions of the negative electrode with a material containing said alkali metal prior to final assembly of said rechargeable battery, said one or more preliminary reactions producing a plurality of product materials in said negative electrode, wherein at least one of said product materials is electrochemically irreversible in said rechargeable battery.

2. The method as described in Claim 1, wherein said alkali metal is lithium.

3. The method as described in Claim 1, wherein said one or more preliminary reactions are electrochemical.

4. The method as described in Claim 2, wherein said one or more preliminary reactions are electrochemical.

5. The method as described in Claim 1, wherein said one or more preliminary reactions are chemical.

6. The method as described in Claim 2, wherein said one or more preliminary reactions are chemical.

7. The method as described in Claim 1, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

8. The method as described in Claim 2, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

9. The method as described in Claim 3, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

10. The method as described in Claim 4, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

11. The method as described in Claim 5, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

12. The method as described in Claim 6, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

13. The method as described in Claim 7, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

14. The method as described in Claim 8, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

15. The method as described in Claim 5, wherein at least one of said one or more preliminary reactions is performed internal to said rechargeable battery.

16. The method as described in Claim 6, wherein at least one of said one or more preliminary reactions is performed internal to said rechargeable battery.

17. A first material that can be used in the negative electrode of a rechargeable battery in which the electroactive species is an alkali metal produced by performing one or more preliminary reactions of said first material with a second material containing said alkali metal prior to final assembly of said rechargeable battery, said one or more preliminary reactions producing a plurality of products in said first material, wherein at least one of said products is electrochemically irreversible in said rechargeable battery.

18. The first material as described in Claim 17, wherein said alkali metal is lithium.

19. The first material as described in Claim 17, wherein said one or more preliminary reactions are electrochemical.

20. The first material as described in Claim 18, wherein said one or more preliminary reactions are electrochemical.

21. The first material as described in Claim 17, wherein said one or more preliminary reactions are chemical.

22. The first material as described in Claim 18, wherein said one or more preliminary reactions are chemical.

23. The first material as described in Claim 17, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

24. The first material as described in Claim 18, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

25. The first material as described in Claim 19, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

26. The first material as described in Claim 20, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

27. The first material as described in Claim 21, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

28. The first material as described in Claim 22, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

29. The first material as described in Claim 23, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

30. The first material as described in Claim 24, wherein at least one of said one or more preliminary reactions is performed external to said rechargeable battery.

31. The first material as described in Claim 21, wherein at least one of said one or more preliminary reactions is performed internal to said rechargeable battery.

32. The first material as described in Claim 22, wherein at least one of said one or more preliminary reactions is performed internal to said rechargeable battery.

33. A rechargeable battery in which the electroactive species is an alkali metal containing a positive electrode, a negative electrode and an electrolyte, wherein said negative electrode contains one or more phases which are electrochemically irreversible phases produced by the use of one or more preliminary reactions of said negative electrode with a material containing said alkali metal prior to final assembly of said rechargeable battery.

34. A rechargeable battery as described in Claim 33, wherein said alkali metal is lithium.

35. A rechargeable battery as described in Claim 33, wherein said one or more preliminary reactions are electrochemical.

36. A rechargeable battery as described in Claim 34, wherein said one or more preliminary reactions are electrochemical.

37. A rechargeable battery as described in Claim 33, wherein said one or more preliminary reactions are chemical.

38. A rechargeable battery as described in Claim 34, wherein said one or more preliminary reactions are chemical.

39. A rechargeable battery as described in Claim 33, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

40. A rechargeable battery as described in Claim 34, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

41. A rechargeable battery as described in Claim 35, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

42. A rechargeable battery as described in Claim 36, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

43. A rechargeable battery as described in Claim 37, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

44. A rechargeable battery as described in Claim 38, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

45. A rechargeable battery as described in Claim 39, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

46. A rechargeable battery as described in Claim 40, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

47. A rechargeable battery as described in Claim 37, wherein at least one of said one or more preliminary reactions was performed internal to said rechargeable battery.

48. A rechargeable battery as described in Claim 38, wherein at least one of said one or more preliminary reactions was performed internal to said rechargeable battery.

49. A rechargeable battery in which the electroactive species is a first alkali metal containing a positive electrode, a negative electrode and an electrolyte, wherein said negative electrode contains one or more phases which are electrochemically irreversible in said rechargeable battery, produced by use of one or more preliminary reactions of said

negative electrode with a material containing a second alkali metal prior to final assembly of said rechargeable battery.

50. A rechargeable battery as described in Claim 49, wherein said one or more preliminary reactions are electrochemical.

51. A rechargeable battery as described in Claim 49, wherein said one or more preliminary reactions are chemical.

52. A rechargeable battery as described in Claim 49, wherein said one or more preliminary reactions are comprised of both chemical and electrochemical components.

53. A rechargeable battery as described in Claim 50, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

54. A rechargeable battery as described in Claim 51, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

55. A rechargeable battery as described in Claim 52, wherein at least one of said one or more preliminary reactions was performed external to said rechargeable battery.

56. A rechargeable battery as described in Claim 51, wherein at least one of said one or more preliminary reactions was performed internal to said rechargeable battery.

57. The method as described in claim 1, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

58. The method as described in claim 2, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

59. The method as described in claim 3, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

60. The method as described in claim 4, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically

irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

61. The method as described in claim 5, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

62. The method as described in claim 6, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

63. The first material as described in claim 17, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

64. The first material as described in claim 18, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

65. The first material as described in claim 19, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

66. The first material as described in claim 20, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

67. The first material as described in claim 21, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by

said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

68. The first material as described in claim 22, wherein said at least one of the electrochemically irreversible in said rechargeable battery product materials produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery product materials produced electrochemically in said rechargeable battery during normal operation after final assembly.

69. A rechargeable battery as described in claim 33, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

70. A rechargeable battery as described in claim 34, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced

electrochemically in said rechargeable battery during normal operation after final assembly.

71. A rechargeable battery as described in claim 35, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

72. A rechargeable battery as described in claim 36, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

73. A rechargeable battery as described in claim 37, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

74. A rechargeable battery as described in claim 38, wherein said at least one of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said at least one electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

75. A rechargeable battery as described in claim 49, wherein said one or more of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said one or more electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

76. A rechargeable battery as described in claim 50, wherein said one or more of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said one or more electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

77. A rechargeable battery as described in claim 51, wherein said one or more of the electrochemically irreversible in said rechargeable battery phases produced by said one or more preliminary reactions is greater than the amount of said one or more electrochemically irreversible in said rechargeable battery phases produced electrochemically in said rechargeable battery during normal operation after final assembly.

